CLAIMS

We claim:

1. A method for determining a cross sectional feature of a measured structural element having a sub-micron cross section, the cross section is defined by an intermediate section that is located between a first and a second traverse sections, the method comprising the steps of:

scanning, at a first tilt state, a first portion of a reference structural element and at least the first traverse section of the measured structural element, to determine a first relationship between the reference structural element and the first traverse section;

scanning, at a second tilt state, a second portion of a reference structural element and at least the second traverse section of the measured structural element, to determine a second relationship between the reference structural element and the second traverse section; and

determining a cross sectional feature of the measured structural element in response to the first and second relationships.

2. The method of claim 1 wherein the first relationship is a distance between a certain point of the reference structural element and a first edge of the first traverse section.

3. The method of claim 2 wherein the first edge of the measured structural element and the certain point of the reference structural element are substantially located on the same plane.

4. The method of claim 1 wherein a height of the certain point of the reference structural element is much smaller than a height of the measured structural element.

5. The method of claim 1 further comprising a preliminary step of generating the reference structural element at the vicinity of the measured structural element.

6. The method of claim 1 wherein during the first tilt stage a measurement angle defined between a measured object that includes the measured structural element and an electron beam that scans the measured structural element is substantially ninety degrees.

7. The method of claim 1 wherein at least one additional structural element is provided at a vicinity of the reference structural element and wherein the steps of scanning further comprise scanning the at least one additional structural element to provide at least one additional relationship between the at least one additional reference structural element and a traverse section of the measured structural element.

8. The method of claim 7 wherein the step of determining is further responsive to the at least one additional relationship.

9. A method for determining a cross sectional feature of a measured structural element having a sub-micron cross section, the cross section is defined by an intermediate section that is located between a first and a second traverse sections, the method comprising the steps of:

scanning, at a first tilt state, a first portion of a reference element and at least the first traverse section of the measured structural element, to determine a first relationship between the reference structural element and the first traverse section and to determine whether to perform an additional scanning;

scanning, in response to the determination of whether to perform an additional scanning, at a second tilt state, a second portion of a reference element and at least the second traverse section of the measured structural element, to determine a second relationship between the reference structural element and the second traverse section; and

determining a cross sectional feature of the measured structural element in response to at least the first relationship.

10. The method of claim 9 wherein performing the second scanning step in response to a feature of the first traverse section.

11. The method of claim 9 wherein the feature is an estimated width or an estimated orientation of the first traverse section.

12. The method of claim 11 wherein the orientation is estimated by comparing detection signals generated as a result of a scan of the first traverse section and detection signals generated as a result of at least one scan of a other traverse sections of known width.

13. The method of claim 9 wherein at least one additional structural element is provided at a vicinity of the reference structural element and wherein the steps of scanning further comprise scanning the at least one additional structural element to provide at least one additional relationship between the at least one additional reference structural element and a traverse section of the measured structural element.

14. The method of claim 13 wherein the step of determining is further responsive to the at least one additional relationship.

15. A method for determining a cross sectional feature of a measured structural element having a sub-micron cross section, the cross section is defined by an intermediate section that is located between a first and a second traverse sections, the method comprising the steps of:

scanning, at a first tilt state, at least a first point of a first reference structural element and at least the first traverse section of the measured structural element, to determine a first relationship between the first reference structural element and the first traverse section;

scanning, at a second tilt state, at least a second point of a second reference structural element and at least the second traverse section of the measured structural element, to determine a second relationship between the second reference structural element and the second traverse section;

determining a cross sectional feature of the measured structural element in response to the first and second relationships.

16. The method of claim 15 wherein the measured structural element is positioned between the first and second reference structural elements.

17. The method of claim 15 further comprising a step of measuring a distance between the first and second points.

18. The method of claim 17 wherein the measured structural element is positioned between the first and second reference structural elements and wherein the step of measuring the distance comprising at least one scan of the first and second points and the measured structural element.

19. The method of claim 18 wherein the at least one scan comprises preventing the electron beam to illuminate the measured structural element.

20. The method of claim 15 wherein the structural element is line that has a top section and two substantially opposing sidewalls.

21. The method of claim 15 wherein the structural element is a contact.

22. The method of claim 15 wherein the structural element is a recess.

23. The method of claim 15 wherein at least one additional structural element is provided at a vicinity of the reference structural element and wherein the steps of scanning further comprise scanning the at least one additional structural element to provide at least one additional relationship between the at least one additional reference structural element and a traverse section of the measured structural element.

24. The method of claim 23 wherein the step of determining is further responsive to the at least one additional relationship.

25. A method for determining a cross sectional feature of a measured structural element having a sub-micron cross section, the cross section is defined by an intermediate section that is located between a first and a second traverse sections, the method comprising the steps of:

scanning, at a first tilt state, a portion of a reference element and at least the first and second traverse sections, to determine at least one relationship between the reference element and the at least one scanned traverse element and to determine whether an additional scanning is required;

performing additional scanning steps, in response to the determination; whereas a tilt state of at least one of the additional scans differs from the first tilt state; and

determining a cross sectional feature of the measured structural element in response to the at least one relationship.

26. The method of claim 25 wherein the step of scanning comprises scanning with an electron beam that is substantially perpendicular to a measured object that includes the measured structural element.

27. The method of claim 25 wherein the determination of whether to perform additional scans is responsive to an estimated width of a traverse section.

28. The method of claim 25 wherein the determination of whether to perform additional scans is responsive to an estimated orientation of a traverse section.

29. The method of claim 25 wherein the determination of whether to perform additional scans is responsive to an estimated cross sectional feature of the measured structural element.

30. The method of claim 25 wherein the determination of whether to perform additional scans is responsive to a relationship between a threshold and an estimated cross sectional feature of the measured structural element.

31. The method of claim 30 wherein the threshold is a maximal width of the measures structural element.

32. The method of claim 30 wherein the threshold is a minimal width of the measures structural element.

33. The method of claim 25 wherein an additional scanning step for determining the first relationship comprises scanning, at a first tilt state, at least a first point of a first reference structural element and at least the first traverse section of the measured structural element.

34. The method of claim 25 wherein an additional scanning step for determining the second relationship comprises scanning, at a second tilt state, at least a point of the reference structural element and at least the first traverse section of the measured structural element.

35. The method of claim 25 wherein at least one additional structural element is provided at a vicinity of the reference structural element and wherein the steps of scanning further comprise scanning the at least one additional structural element to provide at least one additional relationship between the at least one additional reference structural element and a traverse section of the measured structural element.

36. The method of claim 35 wherein the step of determining is further responsive to the at least one additional relationship.

37. A method for determining a cross sectional feature of a measured structural element having a sub-micron cross section, the cross section is defined by an intermediate section that is located between a first and a second traverse sections, the method comprising the steps of:

scanning, at a first tilt state, first portions of a set of reference structural elements and at least the first traverse section of the measured structural element, to determine a first set of relationships between reference structural elements of the set of reference structural elements and the first traverse section;

scanning, at a second tilt state, second portion of the set of reference structural elements and at least the second traverse section of the measured structural element, to determine a second set of relationships between reference structural elements of the set of reference structural elements and the second traverse section;

determining a cross sectional feature of the measured structural element in response to the first and second sets of relationships.

38. The method of claim 37 wherein the step of determining comprises statistical processing of the relationships of the first set to provide a first relationship.

39. The method of claim 37 wherein the step of determining comprises statistical processing of the relationships of the second set to provide a second relationship.

40. The method of claim 37 wherein the set of reference structural elements is positioned at both sides of the measured structural element.

41. The method of claim 37 wherein the set of reference structural elements is positioned at one side of the measured structural element.

42. A system for determining a cross sectional feature of a structural element having a sub-micron cross section, the cross section is defined by an intermediate section that is located between a first and a second traverse sections, the system comprises:

means for directing an electron beam towards an inspection object such as to scan, at a first tilt state, a first portion of a reference structural element and at least the first traverse section of the measured structural element, and to scan at a second tilt state, a second portion of a reference structural element and at least the second traverse section of the measured structural element;

at least one detector that is positioned such as to detect electrons emitted from the structural element as a result of an interaction with the electron beam; and

a processor, coupled to the at least one detector and to the directing means such as to process detection signals received from the at least one detector and to:

determine a first relationship between the reference structural element and the first traverse section;

determine a second relationship between the reference structural element and the second traverse section; and

determine a cross sectional feature of the measured structural element in response to the first and second relationships.

43. The system of claim 1 wherein the first relationship is determined in response to the scan at the first tilt state and wherein the second relationship is determined in response to the scan at the second tilt state.

44. The method of claim 43 wherein the processor is capable of determining the cross sectional feature in response to additional relationships between the measured structural element and additional reference elements.

45. A system for determining a cross sectional feature of a structural element having a sub-micron cross section, the cross section is defined by an intermediate section that is located between a first and a second traverse sections, the system comprises:

means for directing an electron beam towards an inspection object such as to scan, at a first tilt state, a first portion of a reference structural element and at least the first traverse section of the measured structural element, and to scan in response to a determination of a processor whether to perform a second scan, at a second tilt state, a second portion of a reference structural element and at least the second traverse section of the measured structural element;

at least one detector that is positioned such as to detect electrons emitted from the structural element as a result of an interaction with the electron beam; and

a processor, coupled to the at least one detector and to the directing means such as to process detection signals received from the at least one detector and to:

determine a first relationship between the reference structural element and the first traverse section;

determine whether to perform an additional scanning;

determine a second relationship between the reference structural element and the second traverse section, if a second scan is required; and

determine a cross sectional feature of the measured structural element in response to at least the first relationship.